Integrated Laboratory and Field Characterization of Organic Carbon in $PM_{2.5}$ Formed through Chemical Reactions

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An integrated laboratory and field research program is underway at the National Exposure Research Laboratory (NERL) to characterize organic carbon in $PM_{2.5}$ (particulate matter) formed through chemical reactions. Information from this study will provide critical data needed to improve the treatment of secondary organic aerosol (SOA) formation in the Community Multiscale Air Quality (CMAQ) model. In the laboratory portion, SOA-producing hydrocarbon precursors are irradiated in a photochemical reaction chamber in the presence of nitrogen oxide (NO_X) and sulfur dioxide (SO_2). In these reactions, identifiable organic compounds indicative of the precursor gases are formed. These same compounds are then measured in field study samples to ensure that relevant chemical systems are being studied. In collaboration with the California Institute of Technology and the University of Antwerp, analytical methods and instruments are used to identify the products. Collaborative efforts are also underway with the Atmospheric Modeling Division of the NERL to incorporate findings from the field and laboratory measurements to improve the treatment of SOA within CMAQ. The project results should provide the Office of Air Quality Planning and Standards with critical data on important regulatory issues, among them (1) contributions of each SOA precursor to the $PM_{2.5}$ concentration, (2) relative contributions of anthropogenic and biogenic hydrocarbons to ambient SOA concentrations, and (3) impacts of SO_2 reductions on SOA formation. This information will improve the treatment of SOA in the CMAQ model and help States evaluate control strategies for reducing ambient $PM_{2.5}$. These results will support effective regulations and provide information that improves public health and reduces ecological impacts.

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